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Original Article

Amniotic Fluid Index and its relationship with Poor Apgar Score in Term Pregnancy

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ABSTRACT

Background: The Amniotic Fluid Index (AFI) is an essential indicator of fetal well-being during pregnancy. Abnormalities in AFI, such as oligohydramnios (low AFI) or polyhydramnios (high AFI), can have significant implications on neonatal outcomes. The Apgar score, a quick assessment of a newborn's health post-delivery, may be influenced by these variations in AFI.

Objective: This study aimed to investigate the relationship between AFI measurements and Apgar scores in term pregnancies, emphasizing the potential impact of amniotic fluid volume variations on neonatal health.

Methods: Conducted at the Department of Obstetrics and Gynecology, Cantt General Hospital Rawalpindi, this descriptive study spanned six months, from October 2022 to March 2023. It involved 224 pregnant women aged 20-40 years, with gestational ages ranging from 37 to 42 weeks. Exclusion criteria included congenital abnormalities, intrauterine growth restriction, multiple gestations, and high-risk pregnancies. A non-probability purposive sampling technique was used. Ultrasonography was performed to measure AFI, categorizing it into two groups: AFI <50mm and AFI >50mm. Apgar scores were assessed at birth, with scores less than 6 categorized as poor.

Results: The mean age of participants was 31.03±6.18 years, and the mean gestational age was 39.26±1.70 weeks. Of the 224 subjects, 74 (33.0%) had AFI <50mm, and 150 (67.0%) had AFI >50mm. Poor Apgar scores were observed in 61 (40.7%) newborns from the low AFI group and 5 (6.8%) from the high AFI group. The overall incidence of poor Apgar scores was 29.5%, with a significant statistical correlation (p-value = 0.00) between low AFI and poor Apgar scores.

Conclusion: The study demonstrated a significant association between low AFI (<50mm) in full-term pregnancies and poor Apgar scores. These findings highlight the necessity for diligent monitoring and management of amniotic fluid levels to improve neonatal outcomes.

Keywords: Amniotic Fluid Index, Apgar Score, Neonatal Outcomes, Term Pregnancy, Obstetrics, Fetal Well-being.

INTRODUCTION

The critical role of amniotic fluid in fetal development is well-established in medical literature. This clear, pale-yellowish liquid, encasing the fetus within the amniotic sac, serves as a cornerstone for the health and growth of the developing fetus (1). Its significance extends beyond mere physical protection; it is instrumental in temperature regulation, facilitating fetal movement, lung development, and the exchange of nutrients and waste. Additionally, it offers a protective barrier against infections and plays a pivotal role in the overall progression of pregnancy (2).

Throughout the course of gestation, the volume of amniotic fluid undergoes significant changes. It typically escalates until the 34th to 36th week, reaching a peak volume of approximately 800 mL, and then gradually diminishes as the expected time of labor draws near (3). The fluctuations in the volume of amniotic fluid are not merely observational but have profound clinical implications. For instance, a decrease in amniotic fluid volume, a condition known as oligohydramnios, can lead to a spectrum of fetal complications. These include fetal growth restriction, inadequate lung development, and the potential for umbilical cord compression, which could

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impair fetal blood flow (5-7). Notably, oligohydramnios is a concern in up to 15% of pregnancies (8, 9). On the other end of the spectrum, an excessive accumulation of amniotic fluid, termed polyhydramnios, is equally concerning. This condition is often associated with gestational diabetes, fetal anomalies, or complications in the fetal gastrointestinal or central nervous system (10). Polyhydramnios heightens the risk of preterm labor, delivery complications, and challenges during labor (11).

In light of these considerations, the present study aims to investigate the potential correlation between amniotic fluid levels in term pregnancies and neonatal outcomes, with a particular focus on the Apgar score. The Apgar score is a quintessential tool for assessing a newborn's physical condition immediately after birth, encompassing evaluations of heart rate, respiratory effort, muscle tone, reflex irritability, and skin color (12). Each component is scored from 0 to 2, and the total score provides a comprehensive assessment of the newborn's health at one and five minutes post-delivery. The findings from this study could be pivotal in developing strategies to manage low amniotic fluid levels and mitigate their impact on newborn health.

MATERIAL AND METHODS

The study employed a descriptive research design, focusing on pregnant women admitted to the Department of Obstetrics and Gynecology at Cantt General Hospital Rawalpindi. The recruitment process followed a non-probability purposive sampling method. The duration of this study spanned six months, from October 2022 to March 2023, after receiving approval from the Ethical Committee of the respective Hospital.

Participants included in the study were women aged between 20 and 40 years, with a parity of fewer than five, and a gestational age ranging from 37 to 42 weeks (13). The study specifically excluded individuals presenting with congenital abnormalities, intrauterine growth restriction, cephalopelvic disproportion, and a macrosomic fetus (weighing over 4000 grams). Additionally, females with multiple gestations, those experiencing premature rupture of membranes (PROM), and high-risk pregnancies such as pregnancy-induced hypertension (PIH with BP>140/90mmHg), pre-eclampsia, eclampsia, or gestational diabetes were also excluded from the study.

A total of 224 patients were enrolled in the study. Prior to participation, informed consent was obtained from each individual. For confidentiality and ease of tracking, each case was assigned a unique identification number. The researchers conducted thorough clinical examinations of all enrolled individuals to adhere to the selection criteria. Demographic data were collected using a pre-designed questionnaire. Subsequently, a radiologist performed ultrasonography on all the enrolled patients to evaluate the Amniotic Fluid Index (AFI), which involved measuring the sum of amniotic fluid in each quadrant with the largest anteroposterior diameter.

Based on the AFI measurements, patients were categorized into two groups: those with a low AFI (<50mm) and those with a typical AFI (>50mm). Following this classification, all patients were observed until childbirth. The neonatal outcome was assessed using the Apgar score, which was calculated immediately after birth. The Apgar score was used to categorize the newborns into groups, with a score of less than 6 after 1 minute of birth indicating a poor outcome.

The data collected were then subjected to statistical analysis using SPSS version 25 (14). This involved the use of appropriate statistical tests to determine the relationship between the amniotic fluid index and the Apgar score of the newborns, providing insights into how variations in amniotic fluid levels might impact neonatal health. The findings of this study aimed to contribute to a deeper understanding of the clinical implications of amniotic fluid volume variations in term pregnancies.

RESULTS

The results of the study, encompassing a total of 224 patients, present insightful findings on the demographic characteristics of the patients, their Amniotic Fluid Index (AFI) values, and the associated Apgar scores.

Demographically, the age range of the enrolled patients varied between 20 and 40 years, with an average age of approximately 31 years (Mean ± SD: 31.03 ± 6.18). The gestational age at the time of the study ranged from 37 to 42 weeks, averaging around 39 weeks (Mean ± SD: 39.26 ± 1.70). The gravidity of the participants ranged from 1 to 4, with an average gravidity of approximately 2 (Mean ± SD: 2.19 ± 0.93). Regarding parity, the range was from 0 to 2, with an average parity close to 2 (Mean ± SD: 1.79 ± 0.43).

In terms of the distribution of AFI values among the participants, 74 women (33.0%) were found to have an AFI less than 50 mm, while a larger proportion, 150 women (67.0%), had an AFI greater than 50 mm. This distribution highlights a predominant occurrence of typical or higher levels of amniotic fluid among the study population.

Table 1 :Demographic Characteristics of Enrolled Patients (n=224)

Variable	Minimum	Maximum	Mean ± SD
Age (Years)	20	40	31.03 ± 6.18
Gestational Age (Weeks)	37	42	39.26 ± 1.70

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Gravidity	1	4	2.19 ± 0.93
Parity	0.0	2	1.79 ± 0.43

Table 2: Patient Distribution Based on AFI Values (n=224)

AFI	Frequency	Percentage
AFI <50mm	74	33.0%
AFI >50mm	150	67.0%
Total	224	100.0%

Table 3: Stratification of Apgar Scores in Relation to AFI Values (n=224)

AFI	APGAR Score: Poor	APGAR Score: Good	P-value
≤50 mm	61 (40.7%)	89 (59.3%)	0.00
>50 mm	5 (6.8%)	69 (93.2%)	
Total	66 (29.5%)	158 (70.5%)	

The stratification of Apgar scores in relation to AFI values revealed significant findings. Among the women with an AFI of ≤50 mm, 61 (40.7%) newborns had a poor Apgar score, while 89 (59.3%) had a good Apgar score. This indicates a notable prevalence of poor neonatal outcomes in the low AFI group. In contrast, in the group with AFI >50 mm, only 5 newborns (6.8%) had a poor Apgar score, with the majority, 69 (93.2%), showing a good Apgar score. The overall distribution showed that 66 newborns (29.5%) had a poor Apgar score, while 158 (70.5%) were categorized with a good Apgar score. The stark contrast in the percentage of poor Apgar scores between the two AFI groups (40.7% in ≤50 mm vs. 6.8% in >50 mm) is indicative of a significant relationship between the AFI value and neonatal outcome as assessed by the Apgar score. The P-value of 0.00 further corroborates the statistical significance of this association.

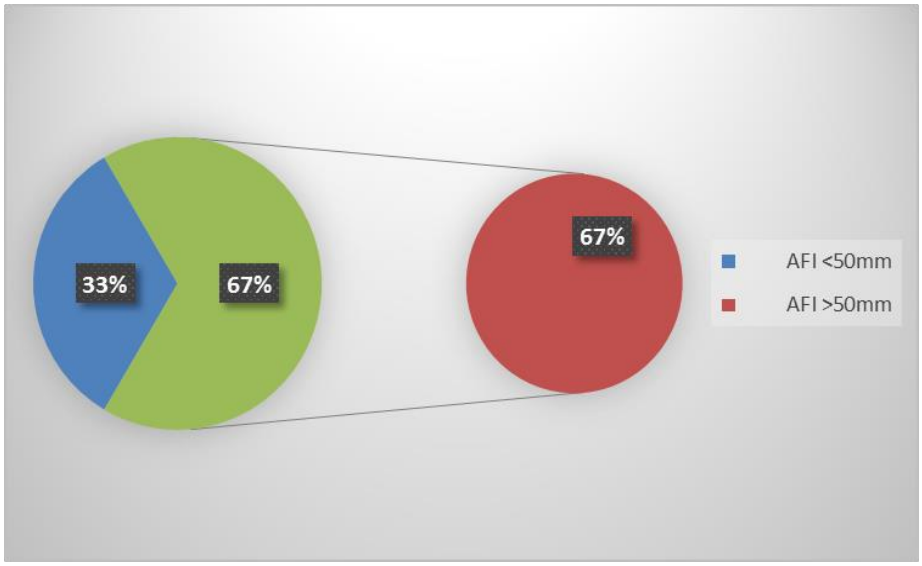

Figure 1 Patient Distribution Based on AFI Value

DISCUSSION

The study's focus was on evaluating the association between the Amniotic Fluid Index (AFI) and Apgar scores in term pregnancies. AFI, a critical metric in obstetrics, measures the volume of amniotic fluid surrounding the fetus, providing insights into fetal health, particularly in the third trimester. The Apgar score, a rapid assessment method used immediately after birth, gauges a newborn's physical status. The interrelation of AFI and Apgar scores is a reflection of the profound impact of amniotic fluid on fetal development and wellbeing.

Our study, which included participants with a mean age of 31.03±6.18 years, echoes the findings of Sehrish Awan et al. (15), highlighting potential correlations between maternal age, low AFI, and poor Apgar scores. Maternal age is a factor worth considering, as advanced maternal age (typically 35 years or older) is often associated with increased obstetric complications, such as gestational diabetes, hypertension, and a higher likelihood of cesarean sections. These complications could indirectly influence both the Apgar score and AFI.

The gestational age in our study aligns with previous research (15, 16), predominantly ranging from 37 to 42 weeks. This duration is crucial as it indicates that as pregnancies progress towards full term, the fetus's capacity to adapt to variations in amniotic fluid levels improves, potentially reducing the risk of poor Apgar scores. In our study, 66 (29.5%) newborns had a poor Apgar score, with a

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significant proportion (61 or 40.7%) being from mothers with AFI <50mm. This finding is consistent with those of other studies (15, 17).

The study conducted by Chate P et al. (18) revealed that pregnant women with an AFI less than 50 mm at term had higher rates of intrapartum complications and lower Apgar scores compared to those with higher AFI values. However, this outcome contrasted with the findings of Pasquini L et al. (19), where no significant differences were observed in delivery modes or neonatal outcomes in pregnancies with oligohydramnios compared to those with normal AFI. Mushtaq E et al. (20) also conducted a study with a similar demographic, finding that patients with AFI < 50mm had higher incidences of labor induction, nonreassuring fetal heart rates, cesarean sections due to fetal distress, and meconium-stained amniotic fluid. However, their findings did not show a significant difference in Apgar scores at 1 minute between the two groups.

The importance of AFI evaluation extends beyond mere monitoring; it is a vital tool for detecting fetal distress and guiding decisions regarding the mode of delivery (21). Proper amniotic fluid levels are essential for fetal protection, movement facilitation, and lung development. Abnormal AFI readings can indicate conditions such as oligohydramnios or polyhydramnios, which are linked with various pregnancy complications (22, 23).

CONCLUSION

In conclusion, the current study underscores the significant prevalence of AFI measurements below 50mm in full-term pregnancies, and the notable association of this lower AFI with increased instances of low Apgar scores. Therefore, it is imperative to advocate for early screening and effective management strategies for this high-risk group to enhance prenatal care and neonatal outcomes.

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